Universe
Scientific Publishing

# Training to Improve Risk Perception:Based on the Perspective of Reducing Fire Casualties and Losses

**Yicheng Han, Jiaxin Shi, Yunji Qin**

**School of Design, Hunan University，Changsha,410012,China.**

***Abstract:***The present study examined in 103 individuals whether an advanced fire training aimed at recognizing, avoiding and handling risks in demanding fire situations, affected perceived risk of fire situations (measured by a questionnaire). The training, which involved both experience and feedback on real performance, specifically intended to emphasize the dangers in potential fire hazards and erroneous recognitions in life. With that emphasis, it was hypothesized that risk perception would increase after as compared to before the training. In addition, this study examined whether risk perception was dependent on gender or on age. A mixed ANOVA performed on mean scores on the questionnaire yielded significant effects on training (before/after) and gender. Before and after training, females had a higher rate of risk perception improvement than males in terms of fire hazards, while males had a higher rate of risk perception promotion than females in the condition of fire escape.

***Keywords:*** Risk perception; Risk recognizing; Fire training

## 1.Introduction

In recent years, there are about 40,000 fires every year in China, killing more than 2,000 people and injuring 300-4,000 people. The direct property losses caused by fires every year amount to more than 1 billion yuan, especially the extremely vicious fires that cause dozens or hundreds of deaths at one time, which cause huge losses to the lives and property of the state and the people (World Fire Statistics Center). In 2019, a total of 233,000 fires were released in the report of the national fire situation issued by Fire and Rescue Bureau, killing 1,335 people and injuring 837, with direct property losses of 3.612 billion yuan. Although urban and rural residential fires accounted for only 44.8 percent of the total, they had caused 1,045 deaths, 78.3 percent of the total, far exceeding the total number of deaths in other places (China Fire Rescue Bureau official website,2019). The similar situation happens in many foreign countries. According to the United Nations' World Fire Statistics Center, there are more than 10,000 fires every day, killing hundreds of people worldwide (World Fire Statistics Center). Fire is one of the frequent disasters in the world today, and the weak awareness of social fire prevention is the main cause of fire, and it seems mainly due to people's weak fire awareness (Jun Liu，2012；Silong Tian, Jun Zhao, Guoliang Liu，2010；Qianghua Xia，2008).

For these sudden disasters, complex technical means can be used to carry out relatively objective risk assessment, however, the vast majority of the general public tends to rely on individual subjective judgment to assess the risk, namely risk perception(slovic，1987，2000). Risk perception mediating process is an important factor that affects people's behavior of fire prevention and disaster reduction. In-depth study of risk perception can understand the role of risk perception in protection behavior, help people make psychological preparation for the risk of sudden disasters such as fire in the future, and improve the overall ability of the society to deal with risks (Huaqiang Li, Chunmei Fan, Jianmin Jia,2009; MARTIN W E, MARTIN I M, KENT B,2009).

According to previous research (Horwarth,1988), there is an association between risk perception and risky behavior. Risk perception directly causes protective action decision-making and behavior. High risk perception leads to protective actions (e.g., evacuation or defend in place), whereas low risk perception may even lead to non-protective actions (e.g., delaying, actively ignoring cues) ( Max T Kinateder , 1 ; Erica D Kuligowski 2 ; Paul A Reneke 2,2015).

Therefore, humans must develop their risk perception in order to reduce their casualties and losses in dangerous fire situations. One of the tools of improving fire risk perception is advanced fire trainings aiming at handling risks in demanding fire situations. The purpose of this research is to assess the utility of such training for humans in developing their risk perception.

Fire safety training has always been a focus of attention all over the world. Currently there are two basic types of fire training: traditional training and fire drills. The traditional training method mainly includes textbook teaching and multimedia presentation, both of which are lack of enough interaction and practical exercise. The fire drills method can effectively help people be familiar with firefighting equipment and learn extinguishing and self- protection skills (A. J. Houvouras, M. T. Harvey,2014). However, due to the constraints of material, manpower and money, fire drills cannot be carried out frequently, which may lead to the decline in people's fire safety ability.[11]. Fire safety education emphasizes the close combination of knowledge learning and operational practice. It is important to choose the appropriate teaching methods (W. Viant, J. Purdy, J. Wood,2016), which will directly affect the teaching effects.

The study by Olipha Nyankuru (Olipha Nyankurua, Stanley Omuteremab, Nicodemus Nyandiko, 2017) have assessed the effectiveness of fire training in the Kenya, which provided proof the function of fire training in reducing fire casualties and losses. There are also much on-going research to improve fire safety training, such as a fire safety education system on campus based on VR technology (K. Zhang, J. Suo, J. Chen, X. Liu and L. Gao, 2017).

Although the present study did not assess the effectiveness of fire training in fire prevention accidents, nor did they measure confidence and overconfidence directly, it examined how risk perception was affected by participating in an advanced fire training which aimed at increasing perceived risk of fire situations. The study focuses on fire hazards and fire escapes training and the relative research result are presented below.

Generally, while fire safety trainings may aim at eliminating hazards before fire and escaping safely in fire, on many occasions such attempts have been considered failures, possibly due to improper expectations of students from such courses. The authors suggested that the skid training may give students the wrong impression that maneuvering skills are more important than anticipating skills. Likewise, they suggest that maneuvering exercises also increase their self-confidence, leading to underestimation of the risks involved, resulting in unsafe response to fire.

Although it is over simplified to say that increased confidence in skills will inevitably lead to more accidents (Katila et al.2004), the designing a training the goal of which is avoiding overconfidence still seems worthy. Assuming that more awareness of the dangers of fire conditions is more or less equivalent to higher levels of perceived risk in such conditions, Gerald Wilde's risk homeostasis theory(1982,1988) RHT provides some basis for implementing trainings that enhance the awareness to risks, and for favoring such trainings upon trainings that reduce risk perception. There is room for arguing that in accordance with the theory (RHT), a training which enhances perceived risks would respectively suppress risky behaviors, reduce accident risk, fire damage and casualties.

The present study, then, seeks to examine whether risk perception was affected by participating in an advanced fire training that specifically intended to emphasize the dangers in fire risk and fire escape. The training involved both experience and feedback on real performance to the fire risk in complex fire situations (such feedback of individual performance has been found efficient as a behavioral tool for positive behavior modification;

K.M. Brown et al., 1981). With the emphasis on avoidance from entering such conditions and on awareness of the possible dangers involved in those conditions, we hypothesized that perceived risk after training would increase compared to before training. although fire escape skills during skidding were taught in the training that was assessed in this study,Based on previous findings of greater perceived risk in the females than in the males (Idoye E P, Park E H, Ntuen C A,2016), this study also examined whether risk perception before and after the course was dependent on gender.

It was expected that the female would show higher levels of perceived risk, as compared to the male, respectively.

# 2.Methodology

## 2.1Participants

Our study adopts the method of questionnaire survey, which is not anonymous.

In this survey, 103 questionnaires were issued and all of them were recovered, among which 58questionnairesare valid, with an effective rate of 58.25%. The invalid questionnaire is due to the inattention of the person filling in the questionnaire. For the questionnaires with some missing data, the mean value substitution method is used for processing. Before the formal survey, 36 questionnaires were distributed for pre-survey. The reliability and validity of the test were verified.

There were 60 individuals (mean = 24.40; S.D. = 8.65; range = 18-50), 31 females (mean = 24.35; S.D. = 9.12; range = 18-50) and 29 males (mean = 26.17; S.D. = 8.00; range = 18-49), who attended the course. Of them, 35(mean = 19.40; S.D. = 1.52), 14 males (mean = 19.86; S.D. = 1.30) and 21 females (mean = 19.10; S.D. = 1.57) were college students.

The two age groups of participants are referred to below as the younger and the older participants. All of the participants in the training were paid for return, which includes the cost of the entire training process.

## 2.2.Advanced firing training

The training was upheld in a fire safety science education center. Its main purpose was to increase both the level of knowledge and experience about the risks inherent in fire. All of the participants attended a 2-3 h theoretical- and practical-course.

The theoretical part provided knowledge about fire fighting equipment (e.g., smoke detector, audible and visual alarm, manual call button) and rescue and fire safety signs (e.g., emergency exit, evacuation exit, fire extinguishing appliance). Additionally, the theoretical part identified conditions which can result in a fire and emphasized avoidance from entering such conditions and awareness of the possible dangers involved in those conditions including recognition of certain behaviors frequently posing fire hazards.

The practical part included the training of principles of emergency maneuvering using previously studied scenarios of fire. These scenarios included prevention prior to the occurrence of a fire and self-help escape and extinguishing the fire during the fire. The training mode includes VR experience, equipment operation and simulation scene demonstration.

The training session included (a) watching the professional instructor in action and (b) imitating the professional and operating by themselves. Each of the exercises was practiced by each of the participants in turn while the instructor demonstrated the exercise and offered effective feedback to each. Each participant tried to physically experience the situation demonstrated. At the end of this phase, the instructor summarized the whole content of the training possess. Additionally, all participants were given a knowledge ability assessment in order to make sure that the knowledge involved in the training has been mastered. It could be felt that a strong impression was left on these young trainees from taking part in this experience.

## 2.3.Risk perception questionnaire

The evaluation of risk perception in fire was obtained by questionnaires designed especially for the study. The questionnaire consists of 35 items (see Table 1) correspondingly representing 35 fire risks and scene of fire (e.g., driving at a speed above 110 kmph in an interurban road; driving while having an important conversation on the phone without a speaker; eating while driving),with varying degrees of risk (e.g., driving at a sharp turn on a wet road; driving in a steep descent with a high gear; driving with loud and exciting music in the background). Each item included a fire

situation and a 1–5 scale on which the respondents were required to mark the degree of risk involved in that condition (1 = not risky at all; 5 = very risky). We sampled all people who filled a valid questionnaire

Table 1

List of the 35 items which composed the Fire Risk Perception Questionnaire, including item means, S.D.s and t-tests for the comparisons between before and after the training

| | Item | Before training | | After training | | t-value |
|---|---|---|---|---|---|---|
| | | Mean | S.D. | Mean | S.D. | |
| 1 | Throw the smoked cigarettes into the flowerpot or on the grass | 2.91 | 1.05 | 4.25 | 1.39 | 3.25 |
| 2 | Plug the toaster and microwave into the same power strip | 2.50 | 1.53 | 4.38 | 0.99 | 3.37 |
| 3 | Dry wet clothes with an electric heater in the cold winter | 2.83 | 1.43 | 4.63 | 0.48 | 3.51 |
| 4 | Place the gas tank horizontally | 3.34 | 1.12 | 4.88 | 0.33 | 3.84 |
| 5 | Turn on exhaust fan for ventilation once discovering a gas leak and alarm with mobile phone | 2.64 | 1.66 | 4.88 | 0.33 | 3.78 |
| 6 | Put the lighter on the dashboard when driving in hot summer | 3.43 | 0.97 | 4.25 | 0.83 | 2.28** |
| 7 | Pile up waste cardboard boxes next to the sunlit window in hot summer | 2.60 | 1.16 | 3.88 | 1.36 | 2.87 |
| 8 | Smoking on the bed or sofa | 2.21 | 1.42 | 4.38 | 0.70 | 4.23 |
| 9 | Use an extension cord to plug the microwave into the power strip | 2.38 | 1.53 | 3.75 | 1.09 | 2.44** |
| 10 | Continue to use discolored sockets | 2.76 | 1.45 | 4.00 | 1.12 | 2.32** |
| 11 | Pull the wires in private to the dormitory to charge electric car | 3.07 | 1.25 | 4.00 | 1.00 | 2.01** |
| 12 | Prepare a lighter next to the gas stove to assist in ignition | 3.14 | 1.27 | 4.50 | 1.00 | 2.90 |
| 13 | Press the neighbor’s doorbell to notify once discovering a gas leak | 1.97 | 1.74 | 4.25 | 1.30 | 3.56 |
| 14 | Use your mobile phone to scan the QR code to pay at the gas station | 1.59 | 1.68 | 3.75 | 0.97 | 3.54 |
| 15 | Burn incense at home to pay homage to the deceased relatives | 1.36 | 1.57 | 3.50 | 1.12 | 3.72 |
| 16 | Wipe off the dust on the socket with a slightly damp cloth | 2.76 | 1.29 | 3.25 | 1.30 | 2.04** |
| 17 | Put cooking oil packed in plastic bottle on the oven | 2.93 | 1.19 | 4.50 | 0.71 | 3.63 |
| 18 | Pull wires on the bed in the dormitory to charge the computer | 2.05 | 1.56 | 3.50 | 1.41 | 2.49** |
| 19 | Bubbles appear when dip soapy water with a brush and smear it on the gas pipe | 3.12 | 1.26 | 4.13 | 0.78 | 2.2** |
| 20 | Seal or conceal the installation of gas facilities | 2.62 | 1.46 | 4.63 | 0.48 | 3.84 |
| 21 | Hang the clothes out on the wires | 3.53 | 0.97 | 4.71 | 0.45 | 3.37 |
| 22 | Woke up in midnight, fired, the doorknob was hot and the corridor was thick with smoke when you opened the door, still, you evacuated quickly | 1.79 | 1.84 | 4.71 | 0.45 | 4.44 |
| 23 | Escape toward the bright light from a fire in midnight | 2.62 | 1.58 | 4.57 | 0.73 | 3.42 |
| 24 | Open the doors or windows immediately to check the situation when there is a fire | 2.10 | 1.65 | 4.43 | 0.73 | 3.92 |
| 25 | Quickly open the door to evacuate and keep the door open once discovering a fire in the house | 2.66 | 1.48 | 4.71 | 0.45 | 3.87 |
| 26 | Quickly put out a lot of water when paints caught fire | 2.88 | 1.38 | 4.71 | 0.45 | 3.70 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 27 | Evacuate quickly and calling for help when there is a fire | 1.98 | 1.84 | 4.86 | 0.35 | 4.39 |
| 28 | Take the elevator to escape from a firing building | 3.50 | 0.95 | 5.00 | 0.00 | 4.44 |
| 29 | Extinguish the fire of metal medicines burning in chemical laboratories with dry powder fire extinguishers | 1.72 | 1.83 | 3.86 | 1.25 | 3.20 |
| 30 | Extinguish the fire of projector in classrooms with foam fire extinguisher | 1.95 | 1.72 | 4.14 | 1.36 | 3.45 |
| 31 | When escaping through the dense smoke , take away the wet towel shortly for ventilation | 2.66 | 1.53 | 4.43 | 0.90 | 3.18 |
| 32 | Open and put on the fire gas mask directly | 1.76 | 1.45 | 4.86 | 0.35 | 5.99 |
| 33 | Run quickly downwind when there is a fire | 2.88 | 1.44 | 4.71 | 0.45 | 3.55 |
| 34 | Hung a rope from the eighth floor of a building to escape from a severe fire | 3.03 | 1.33 | 4.29 | 0.45 | 2.64** |
| 35 | Cut off the power and extinguish the fire from the front when TV sets and computers are on fire | 2.14 | 1.58 | 4.14 | 1.12 | 3.45 |

** means significant at the 5% level, and other unmarked ones significant at the 1% level

according to the same sex ratio as the total sample. All of the participants who received the training completed the questionnaire twice—before the training (Cronbach's alpha = .91) and after the training (Cronbach's alpha

= .92). They completed the questionnaire several days before the training, and immediately after it at the training site. Finally, although they were informed that at the end of the research no personal information would be kept and the questionnaire was not anonymous, the participants were not given any details regarding the purpose of the questionnaire or about the study.

## 3.Results and analysis

In order to test the reasonableness of perceived risk data. Levene's test for homogeneity of variances was performed on the perceived risk data, separately before and after the training. There were no apparent differences between group variances, and the perceived risk data meet the homogeneity of variance. (Fs < .40; PS > .10)

Under the condition that the data conforms to the homogeneity of variance, with the aim at detecting whether the difference in the scores of each question before and after training is significant, we conducted a t-test on the risk perception scores before and after training, which can be seen in Table 1.

In order to check if risk perception differed as a function of the different conditions, repeated measure ANOVAs were performed on the ratings of risks. Because the group of the participants consisted of both male and female, besides to running an ANOVA on the complete sample, a2(×2) ANOVA (Gender (×Training)) was also performed on mean perceived risk scores on the questionnaire. Neither the main effect of Gender nor the interaction was significant.

However,according to the main effect analysis of train*gender, there were significant differences between male and female performance before and after training. (Fs (1,62) =21.84 and 23.89, $p<0.001$)

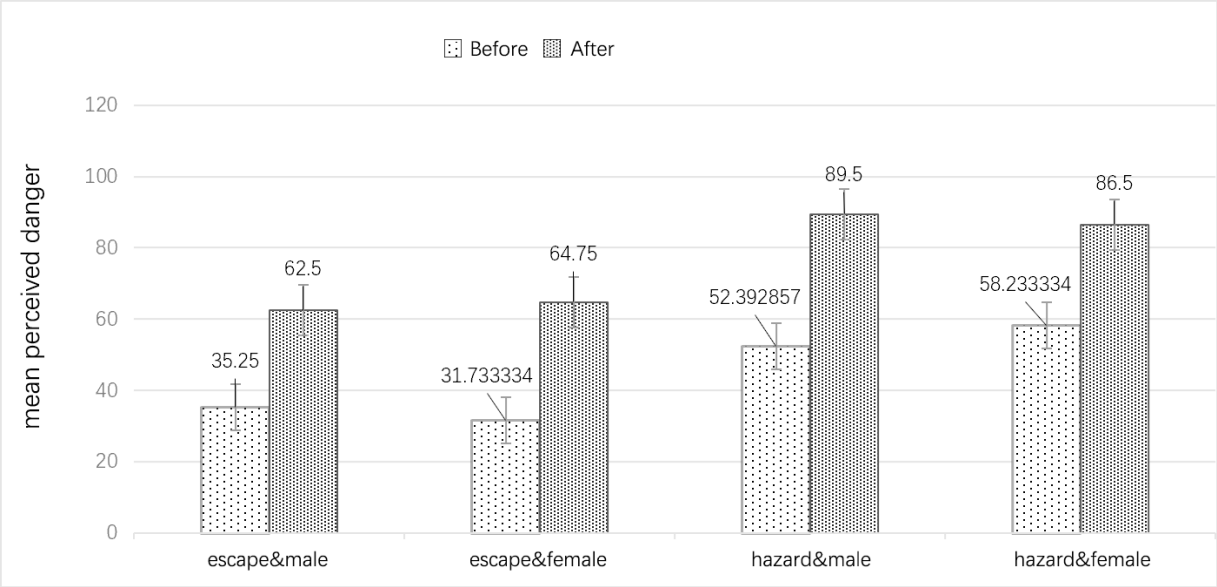


Fig. 1. Mean perceived risk scores as a function of knowledge category (fire hazards and fire escape), gender (female and male), and training (before and after). Error bar represent standard error of means.

Overall, there were higher scores of risk perception after the training (mean = 151.63; S.D. = 15.51) as compared to before the training (mean = 88.84; S.D. = 24.84), fire hazards (mean = 88.00; S.D. = 9.50) scored higher than fire escape (mean = 63.62; S.D. = 4.42). And there was no significant difference in risk perception scores between males (mean = 152.00; S.D. = 20.80) and females (mean = 151.25; S.D. = 14.43).

Fig. 1 displays mean scores of perceived risks as a function of knowledge category (fire hazards and fire escape), gender (female and male), and training (before and after). As can be seen in Fig. 1, Before training, males had a higher risk perception than females, and after training, females had a higher risk perception than males.

Besides before and after training, females had a higher rate of risk perception improvement than males in

terms of fire hazards, while males had a higher rate of risk perception promotion than females in the condition of fire escape.

In addition, as it shows in the Table 1, according to the results of the T test, we discovered that people's risk perception level has a significant difference for the subjects belonging to the life knowledge type. On the contrary, there was no significant difference in people's risk perception levels, in terms of those descriptions that involve relevant expertise or that are rarely mentioned in our daily life.

Primarily, the results of this study, specifically the significant main effect of training supports its main prediction that perceived risk would increase after training, compared to before. These results are indeed consistent with the emphasis of the training that was evaluated in this study (see Section 2.2), strongly suggesting that the training succeeded bolding the dangers and the difficulties of preventing an accident once there is a risk of fire or when fire breaks out.

# 4.Discussion

Primarily, the results of this study, specifically the significant main effect of training supports its main prediction that perceived risk would increase after training, compared to before. These results are indeed consistent with the emphasis of the training that was evaluated in this study (see Section 2.2), strongly suggesting that the training succeeded bolding the dangers and the difficulties of preventing an accident once there is a risk of fire or when fire breaks out.

As can be seen in Table 1, except for items 6, 9, 10, 11, 16, 18, 19, 34 in the questionnaire, all of the items were ranked with significantly higher means after, as compared to before training. A close inspection at the means of the non-significant items suggests that the absence of apparent differences (before versus after training) resulted from a ceiling effect—these items (e.g., "Pull the wires in private to the dormitory to charge electric car"; "Pull wires on the bed in the dormitory to charge the computer") seem to present high risk-perceived activities, already prior to the training. Importantly, these behaviors are followed by severely punishment.

Apparently, the trainees generalized from items that were more seriously dealt with in the training (i.e., Items describing fire hazards [4,5, 8, 20]; fire judgment in fire escape [22,24,25,27,28] and Open and put on the fire gas mask directly [32]), to the rest of the items. Generally, the training process, which included the conceptualization of the special experience made by the trainers, seems to have led to a better understanding and internalization of the specific safety values (Gillespie, 2006). More specifically, the exercises performed on the training site were aimed to demonstrate to the participants that it is nearly impossible to elude the emergency conditions they experienced. J. Fennelly (1969) suggest that the feeling of mastering the basic skills involved in fire prevention and fire escape is a crucial component in risky behavior of people's dangerous behavior in a fire. Relatively, as long as they fail to feel that their lives are threatened, most people do not care about these fire hazards. The increased risk awareness of the participants in the present study, likely resulted from the emphasis put on the thin line between control and loss of control in dangerous fire conditions. This thin line, we suggest, should be emphasized in standard training processes of humans, as well as in advanced trainings.

Before interpreting the effects of fire risk category and gender, there is room to go into some details about the similarities and differences between the training evaluated in the present study and those evaluated by former studies (Vasileios Koutsomarkos, David Rush, Grunde Jomaas, Angus Law, 2020; K. Zhang, J. Suo, J. Chen, X. Liu and L. Gao,2017). Thus, while the idea of training anticipation skills and teaching or demonstrating the possible dangers are still common with both the general fire trainings and the training evaluated here.

Fuqiang Yang (2020) who examined the age and gender ignoring safety hazards that cause fires, also found that the female is more inclined to report fire hazards than the male and it is more functional to fire risks response in the female than in the male. This finding is at least meaningful in promoting and enhancing risk perception among people with different genders, which remind us that different ways should be applied to different genders.

## 4.1 Methodological considerations

The questionnaire method is effective to gather necessary information for this research. But it is highly influenced by the questions covered in questionnaires and constrained with sample size and composition.

First of all, each and all different factors may generally, contribute to response set biases and differences in theses biases among groups, including the anonymity of the questionnaire, different experience among the participants, the timings of administrations of the questionnaire (see Section 2.3), and circumstances of the training (see Section 2.1). The data gathered reflects different tendencies of experimenters' reaction. The higher risk estimates following the training also indicates that the messages regarding the risks in fire were clear.

Secondly, the conditional restriction leads to the smaller sample size after training, because only limited number of people are possible to participate the training. But the result is realistic to reflect the function if advanced training.

Thirdly, in order to overcome possible faults which might be associated with the questionnaire used in the present study to evaluate perceived risk, a method which has been successfully used in the past by Finn and Bragg (1986) can be adopted. As per the research, the risk of accident involvement was estimated with three different methods, including general questions about accident involvement, firing situations illustrated in still photographs, and videotaped firing situations.

### 4.2 Future research

The present study found an increment in perceived risk associated with advanced fire training, showing that trainings targeted at enhancing risk perception is functional and significant. The theoretical basis for favoring fire trainings that enhance perceived risks upon trainings that do not enhance or that reduce subjective estimates of risks can be provided by risk homeostasis theory (Wilde,1982). The practical foundation can be put forward further at two categories.

One is the questionnaire design. The effectiveness of research applying questionnaire method highly depends on the questionnaire design. As for the proceeding research, the 35 items sufficiently reflect the common situation which may leads to fire accidents. But the questionnaire can be expanded cover more occasions while the questions included can be more practical and more usual. In the future, assessing risk perception in an experiment that also assesses the effectiveness of the training in reducing fire losses and fire casualties, would allow advancing the study of the relations between risk perception, expertise and fire safety. While generally, including as far as fire situation is concerned, people tend to overestimate themselves relative to others (Dunning, 2005; Dunning et al., 2004), there are also differences in levels of confidence that are group- and domain-specific, assessment of perception of own fire safety skill would be necessary to account for compensation of higher risk levels. Such assessment (of the perception of own fire safety skills) is strongly related to the problem of overconfidence, which is cardinal in this type of fire training. Together with the assessment of the effectiveness of the training in reducing, risk taking behaviors, near fire accidents, assessment of the perception of own fire safety skills would therefore provide a direct measure of confidence.

Another one is sample selection. In this study,the risk perception positively correlated with age, and was also

a function of gender, with higher levels (of perceived risk) in the female than in the male. The general patterns of the data are consistent with the conception that young male trainees do not perceive firing as being as risky as female- and as older- (male- and female-) drivers perceive it (Finn and Bragg, 1986).

Although the analysis of variance between gender and training showed that the difference in perceived risk was found to be insignificant, we still need to investigate further to determine our results. The current research cannot fully distinguish the effects of age and experience on perceived risk. The forwarding research should expand the sample size and also structure. At least five adjustment should be made in the future research:

a) Classified all the participants into two groups according to the gender: the female group and the male group;

b) Classified all the participants into different age: younger than 20, 20 years old to 40 years old, 40 years old to 70 years old, older than 70;

c) Cover different regions: send questionnaires to people in different provinces;

d) Especially select people with different education background;

e) Especially select people with different occupations.

On the basis of larger sample size, we expect the future research may be more convincing and meaningful with these improvements.

## References

[1]China Fire Rescue Bureau official website,2019.

[2] Dunning, D., 2005. Self-insight: Roadblocks and Detours on the Path to Knowing Thyself. Psychology Press, New York.

[3] Dunning, D., Heath, C., Suls, J.M., 2004. Flawed self-assessment: implications for health, education, and business. Psychol. Sci. 5, 69–106 (public interest).

[4] Finn,P.,Bragg, B.W.E.1986.Perception of the risk of an accident by young and older drivers.Accid.Anal. Prev.18,289–298.

[5] Fuqiang Yang, Jing Tao, Chao Chen, Fanliang Ge, Genserik Reniers, Determining the perceived safety and security

attitude and knowledge of urban residents towards bus fires, Burns, Volume 46, Issue 3, 2020, Pages 687-694.
[6] Gillespie, A., 2006. Games and the development of perspective taking. Hum. Dev. 49, 87–92.
[7] Greg Benson, Chapter 14 - Fire Prevention, Detection, and Response, Editor(s): Sandi J. Davies, Lawrence J.Fennelly, The Professional Protection Officer (Second Edition), Butterworth-Heinemann, 2020, Pages 157-164
[8] Hellmers, Henry, Fight Fire with Fire, 945--947, 1969,Science.
[9] Horwarth, I., 1988. The relationship between objective risk, subjective risk and behavior. Ergonomics 31, 527– 535.
[10] Houvouras, M. T. Harvey, “Establishing fire safety skills usingbehavioral skills training,” Journal of Applied Behavior Analysis, vol.47, pp. 420-424
[11] Huaqiang Li, Chunmei Fan, Jianmin Jia, et al. Public Risk Perception and Emergency Management in Sudden Disaster——Taking the 5·12 Wenchuan Earthquake as an example[J]. Management World, 2009 (6): 52-60.
[12] Idoye E P, Park E H, Ntuen C A. Gender Differences in Risk Perception of Trust and Bias in Cyberspace[J]. IARJSET,2016, 3(1):8-12.
[13] Jun Liu. The characteristics of ancient building fire and fire safety management [J]. Fire technology and product information, 2012(3): 11-12.
[14] Katila, A., Keskinen, E., Hatakka, M., Laapotti, S., 2004. Does increased confidence among novice drivers imply a decrease in safety? The effects of skid training on slippery road accidents. Accid. Anal. Prev. 36, 543–550.
[15] Kinateder, MT, Kuligowski, ED, Reneke, PA, etc. Re-examination of risk perception in fire evacuation behavior: definition, related concepts and empirical evidence. Fire Sci Rev 4, 1 (2015). 10.A. J.
[16] K.M. Brown, B.S. Willis, D.H. Reid, Differential effects of supervisor verbal feedback and feedback plus approval on institutional staff performance, Journal of Organisational Behavior Management, 3 (1981), pp. 57-68
[17] K. Zhang, J. Suo, J. Chen, X. Liu and L. Gao, "Design and implementation of fire safety education system on campus
[18] based on virtual reality technology," 2017 Federated Conference on Computer Science and Information Systems (FedCSIS), Prague, 2017, pp. 1297-1300.
[19] MARTIN W E, MARTIN I M, KENT B. The Role of Risk Perceptions in the Risk Mitigation Process: the Case of Wildfire in High Risk Communities[J]. Journal of Environmental Management, 2009, 91(2): 489-498.
[20] Max Kinateder, Enrico Ronchi, Daniel Gromer, Mathias Müller, Michael Jost, Markus Nehfischer, Andreas Mühlberger, Paul Pauli,Social influence on route choice in a virtual reality tunnel fire,Transportation Research Part F: Traffic Psychology and Behaviour,Volume 26, Part A,2014,Pages 116-125.
[21] Qianghua Xia. Cause analysis and prevention of ancient building fire[J]. Science and Technology in Western China, 2008, 7(24)： 40-41.
[22] Silong Tian, Jun Zhao, Guoliang Liu. Analysis on the Causes of Ancient Building Fire and Research on Fire Prevention Countermeasures[J]. Logistics Engineering and Management,2010(7):153-154.
[23] Slovic, P., 1987, “Perception of Risk”, Science, 236, pp.280~285.
[24] Slovic, P., 2000, The Perception of Risk, London: Earthscan.
[25] Olipha Nyankurua , Stanley Omuterema, Nicodemus Nyandiko Evaluating the Effectiveness of Fire Safety Training on Occupants’ Response to Fire in Selected Public Buildings in Nairobi County, Kenya, 2017, IJSBAR.
[26] World Fire Statistics Center
[27] Wilde, G.J.S., 1982. Critical issues in risk homeostasis theory. Risk Anal. 2, 249–258.
[28] Wilde, G.J.S., 1988. Risk homeostasis theory and traffic accidents: propositions, deductions and discussion of dissension in recent reactions. Ergonomics 31, 441–468.
[29]W. Viant, J. Purdy, J. Wood, “Serious games for Fire and Rescue training,” in 8th Computer Science and Electronic Engineering Conference, pp. 136-139, 2016.